LEAK CHECKING SILICA GEL CARTRIDGES

Purpose

This Meteorology and Air Quality Group (MAQ) procedure describes the process to perform leak checks of the plastic silica gel cartridges used to collect water samples in the AIRNET system.

Scope

This procedure applies to the individuals assigned to perform leak checks of the silica gel cartridges using the helium tank and leak detector at TA-54-1001 ("Cave").

In this procedure

This procedure addresses the following major topics:

Hazard Control Plan

The hazard evaluation associated with this work is documented in Attachment 1: Initial risk = **low**. Residual risk = **minimal**. Work permits required: **none**. First authorization review date is one year from group leader signature below; subsequent authorizations are on file in group office.

Signatures

Prepared by: Digitally signed by C Jake Martinez serialNumber=081905 + cn=C Jake Martinez, ou=People, ou=Los Alamos National Laboratory, ou=Department of Energy, o=U.S. Government, c=US Date: 2004.01.12 09:45:26 -07'00' Reason: <none> Location: (signed) Jake Martinez, MAQ	Date: 1/6/04
Approved by: Craig F Eberhart (signed) Craig Eberhart, Air Quality Monitoring Project Leader	Date: 12/19/03
Approved by: Terry Morgan Terry Morgan, QA Officer	Date: 12/19/03
Work authorized by: Jean M Dewart Jean Dewart, MAQ Group Leader	Date: 12/24/03

01/08/04

General information about this procedure

Attachments

This procedure has the following attachment:

Number	Attachment Title	No. of pages
1	Hazard Control Plan	2
2	AIRNET Silica Gel Cartridge Leak Testing	1

History of revision

This table lists the revision history and effective dates of this procedure.

Revision	Date	Description Of Changes
0	9/27/99	New document.
1	8/23/01	Slightly revise wording in Hazard Control Plan and added Attachment 2.
2	1/15/04	Add step to weigh cartridges for empty weights.

Who requires training to this procedure?

The following personnel require training before implementing this procedure:

- Technicians assigned to perform leak checks of the cartridges.

Personnel previously trained to revision 1 of this procedure do not require re-training to this revision.

Training method

The training method for this procedure is **on-the-job** training by a previously-trained individual and is documented in accordance with the procedure for training (MAQ-024).

Prerequisites

In addition to training to this procedure, the following training is also required prior to performing this procedure:

- MAQ-011, “Logbook Use and Control”
- Cardiopulmonary Resuscitation (CPR)
- PS-13 class “Pressure Safety Orientation”
- PS-13 class “Gas Cylinder Safety”

References

The following documents are referenced in this procedure:

- MAQ-011, “Logbook Use and Control”
- MAQ-024, “Personnel Training”
- MAQ-204, “Sampling of Ambient Airborne Tritium”
- Instruction manual for Matheson “Leak Hunter Plus” Model 8066

Performing leak checks

Purpose of leak checking

The silica gel cartridges are plastic cylinders with screw-on metal ends. A plastic plug, with the quick-disconnect fitting, is screwed into the metal end. The plastic plug occasionally becomes cracked and can allow air to enter, bypassing the silica gel. The cracks are not easily noticed and can allow significant air leakage past the silica gel. Also, missing o-rings under the caps and plugs will be found by leak testing.

WARNING: breathing He gas

Helium gas is a simple asphyxiant and excessive concentrations (greater than 5%) may reduce the oxygen supply enough to cause light-headedness or unconsciousness. This gas has been inhaled for entertainment purposes. DON'T DO IT.

Frequency of leak checks

All cartridges for each bi-week period (either blue or gold) should be checked every six months.

Equipment needed

The following equipment is used to perform the leak checks:

- Tank of He gas
- Matheson "Leak Hunter Plus" Model 8066
- Pressure regulator for He tank
- Hose with pressure relief valve (22 psi) and quick-disconnect fitting
- Cartridges to be checked, empty of silica gel

Steps to check for leaks

To check for leaks in the cartridges, perform the following steps:

Step	Action
1	Check the He tank in the straps on door opening into main room of Cave and ensure it is secure. Do not move the tank – gas plant personnel **only** will move the cylinders. **CAUTION**: **Proper restraint of high pressure gas cylinders is important.**
2	If necessary, attach regulator unit to He bottle.
3	Turn black knob on pressure regulator ***counter-clockwise*** until it stops (this ensures the regulator is set to zero pressure before the main tank valve is opened).
4	Open the main tank valve.

Performing leak checks, continued

Step	Action
5	SLOWLY turn the black knob on the pressure regulator ***clockwise*** until the gauge reads **10 psi**. **NOTE**: If the pressure is set higher than about 20 psi, the pressure relief valve will start to open and release He gas.
6	Turn on the leak detector unit by pressing ON. The unit will self-test, then should read "x10^{-5}." Ensure the unit reads "ml/sec" in the lower part of the display. If necessary to change the display units, see the instruction manual.
7	Optional: Attach the lower fitting on the silica gel cartridge to a suitable stand, such as the manifold assembly on the old leak detector unit.
8	Ensure the end of the silica gel cartridge is closed off, either by a quick-disconnect fitting that is disconnected, or by closing the valves below the fittings. If using the manifold assembly, open two of the valves on the manifold.
9	Attach the quick-disconnect fitting from the tank to the top of the silica gel cartridge. This will pressurize the cartridge with He.
10	Start at the top of the cartridge and move the leak detector probe tip around the silica gel cartridge to sniff for leaks. It takes one second for the gas to travel from the tip to the internal sensor, so move slowly and allow time for the unit to clear itself if necessary.
11	After checking a cartridge, disconnect it from the hose at the top and remove it from the stand.
12	On a form (similar to Attachment 2) or in the logbook for leak checking, record the station number and color (either blue or gold) of the cartridge checked. Follow the requirements in MAQ-011 when making logbook entries.
13	To check the next cartridge, repeat steps 7 through 12.
14	When done checking the last cartridge, close the main tank valve and turn off the leak detector.

Weigh empty cartridges

At the time of leak checking or when requested by the team leader, weigh each empty fully-assembled cartridge and record the weight in the Access AIRNET database in the form for gel empty weights. Follow the steps for weighing as described in MAQ-204. (These data are used to calculate the weight of silica gel used each sampling period.)

Records resulting from this procedure

Records

The following records are generated as a result of this procedure and will be submitted according to MAQ-011:

- Entries in the leak checking logbook

Air Quality Group

HAZARD CONTROL PLAN

1. The work to be performed is described in this procedure.
"Leak Checking Silica Gel Cartridges"

2. Describe potential hazards associated with the work (use continuation page if needed).

a. High pressure tank of gas.

b. Inhaling He gas.

c. Explosion of cartridge due to accidental over-pressuring.

3. For each hazard, list the likelihood and severity, and the resulting initial risk level (before any work controls are applied, as determined according to LIR300-00-01, section 7.2)

a. High pressure tank of gas: tank contains very high pressure gas and if tank fell over and regulator valve were knocked off, could become dangerous missile. Likelihood = remote, severity = critical: initial risk = minimal.

b. Inhaling He gas: He gas is a simple asphyxiant. Excessive concentrations (greater than 5%) may reduce the oxygen supply enough to cause light-headedness or unconsciousness. Likelihood = improbable, severity = negligible: initial risk = minimal.

c. Explosion of cartridge due to accidental overpressuring: Cartridge could explode if pressurized over the manufacturer's safe limit of 110 psi. Likelihood = improbable because pressure regulator limits pressure in line. Severity = critical: Initial risk = low.

Overall *initial* risk: ☐ Minimal ☒ Low ☐ Medium ☐ High

4. Applicable Laboratory, facility, or activity operational requirements directly related to the work:
☒ None ☐ List: Work Permits required? ☒ No ☐ List:

HAZARD CONTROL PLAN, continued

5. Describe how the hazards listed above will be mitigated (e.g., safety equipment, administrative controls, etc.):

a. High pressure tank of gas: tank will be secured and mounted in accordance with requirements for gas bottles. Only gas plant personnel will move tank. Tank of gas likely to last for years.

b. Inhaling He gas intentionally: A sign will be posted on the tank to discourage inhaling of the gas.

c. A safety pressure relief valve (set at 10 to 20 psi) will be installed in the line used to pressurize the cartridges. This will vent any pressure over 50 psi that occurs in the line, thus limiting maximum pressure in the cartridges to a value well under the manufacturer's safe pressure limit of 110 psi.

6. Knowledge, skills, abilities, and training necessary to safely perform this work (check one or both):

☒ Group-level orientation (per MAQ-032) and training to this procedure.

☒ Other → See training prerequisites on procedure page 3. Any additional describe here:

7. Any wastes and/or residual materials? (check one) ☒ None ☐ List:

8. Considering the administrative and engineering controls to be used, the *residual* risk level (as determined according to LIR300-00-01, section 7.3.3) is (check one):

☒ Minimal ☐ Low ☐ Medium (requires approval by Division Director)

9. Emergency actions to take in event of control failures or abnormal operation (check one):

☒ None ☐ List:

Signature of preparer of this HCP: This HCP was prepared by a knowledgeable individual and reviewed in accordance with requirements in LIR 300-00-01 and LIR 300-00-02.

Preparer(s) signature(s)	Name(s) (print) /Position	Date

Signature by group leader on procedure title page signifies authorization to perform work for personnel properly trained to this procedure. This authorization will be renewed annually and documented in MAQ records. Controlled copies are considered authorized. Work will be performed to controlled copies only. This plan and procedure will be revised according to MAQ-022 and distributed according to MAQ-030.

Air Quality Group

AIRNET Silica Gel Cartridge Leak Testing

This form is from MAQ-234

Date tested:

Cartridge color: Gold Blue

Cartridge #	Pass?	Comments

Tested by:

Signature(s) Name(s) (print) Date

Air Quality Group

AIRNET Silica Gel Cartridge Leak Testing

This form is from MAQ-234

Date tested:	**Cartridge color:** Gold Blue	
Cartridge #	**Pass?**	**Comments**

Tested by:

Signature(s) Name(s) (print) Date